



MACHAKOS UNIVERSITY

University Examinations 2019/2020

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

SIT 110- INTRODUCTION TO STATISTICS

DATE: 18/1/2021

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

Answer question ONE and any other TWO questions

QUESTION ONE (30 MARKS) COMPULSORY

- a) Explain the meaning of the following terms as applied in Statistics
- i. Sample
 - ii. Data (2 marks)
- b) Differentiate between EACH of the following terms:
- i. Discrete and continuous variable (2 marks)
 - ii. Point and interval estimation (2 marks)
- c) The table below shows goals scored by teams in a competition

Goals scored	1	3	4	5	6
Frequency	6	10	25	11	2

Calculate the mean and standard deviation (6 marks)

- d) In a random sample of 64 customers in a computer service company, the mean waiting time for being served is 3 minutes with a standard deviation of 1.5 minutes. Construct a 99% confidence interval for the average waiting time in the company. (4 marks)

- e) A company has a computer system that can process 1200 bills per hour. A new system is installed that can process an average of 1260 bills per hour with a standard deviation of 215 bills in a sample of 40 hour. Test if the new system is significantly better than the old one at the 5% level of significance. (5 marks)
- f) A number is chosen at random from the numbers 1,2,...,30. Determine the probability that it is:
- i. divisible by 3
 - ii. divisible by 4
 - i. divisible by both 3 and 4
 - ii. divisible by 4, given that it is divisible by 3. (4 marks)
- g) Determine the values of a, b, c, d, e from the following ANOVA Table

	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ration
Factor	a	2	c	e
Error	1750	b	d	
Total	2572.22	8		

(5 marks)

QUESTION TWO (20 MARKS)

- a) Explain the meaning of the following terms as used in probability theory:
- (i) An event
 - (ii) Random experiment
 - (iii) Mutually exclusive events
 - (iv) Independent events (8 marks)
- b) The data below shows gross weekly earnings of employees by age of an IT company in the year 2008.

Age (years)	18	20	22	27	35	45	55
Weekly earnings ('000)	15.50	23.20	34.0	44.90	53.10	55.0	57.20

- i) Calculate the least squares regression line of gross weekly earnings on age.

(10 marks)

ii) Use the equation in (i) to estimate the weekly earnings of an employee aged 50 years

(2 marks)

QUESTION THREE (20 MARKS)

a) A large IT company finds that the typical office worker spends an average of 13 minutes per hour on non-work related activities. On a trial basis management sets up new enclosed work stations for a randomly selected group of 12 workers and finds that the average number of minutes lost per hour is 11.3 with a standard deviation of 3.7. At the 5% level of significance can we conclude that the new work stations represent a significant change? (8 marks)

b) The following are the speeds, in miles per, of a group of cars on a high-way as measured with radar gun
58,62,59,53,61,55,57,54,59,53,66,60,58,60,61,58,56,60,58,62,57,55,53,55,61,57,52,58,49,54,52,55,57,60,64,67.

i) Construct a frequency distribution table with class interval by 45-49,...etc (6 marks)

ii) use the table in b (i) above to calculate

(ii) the mode (3 marks)

(iii) the median (3 marks)

QUESTION FOUR (20 MARKS)

a) A small company is interested in analyzing the effects of advertising on its sales. Over a 5-month period the results are as follows

Money spend on advertising (sh. 000')	Total sales (sh. '000')
5	6
8	15
10	20
15	30
22	39

Calculate the correlation coefficient between sales and advertising. (8 marks)

- b) The following table shows the number of children in households in Mombasa County in 2010

Number of children in the household	Number of households
None	25
1	40
2	42
3	28
4	18
5	11
6	9
7 or more	<u>6</u>
	179

- (i) Calculate the mean and standard deviation of children per households.
(7 marks)
- (ii) Assuming the data is based on a simple random sample from a large population; calculate a 95% confidence interval for the mean number of children in Mombasa county
(5 marks)

QUESTION FIVE (20 MARKS)

- a) Perform an analysis of variance calculation for the data given below at $\alpha=0.01$ level of significance.

Levels of factor

A	B	C
12	10	8
14	6	20
9	12	12

(10 marks)

- b) A survey is conducted among workers in a certain city to determine if there is any difference between proportions of women, men who drive, take a bus, or take a train to work. The results are as shown below:

	Drive	Bus	Train
women	25	100	125
men	75	120	205

- i) Construct the corresponding cross-tabular contingency table for the expected frequencies. (6 marks)
- ii) Determine the value of the chi-square statistic (4 marks)